

Nutrition Basics

Michael Sprang M.D.
Loyola University Medical Center

Why Nutrition

- Malnutrition is presents in 30-55% of all inpatients on numerous studies
- Increased length of stay & increased readmission (esp. elderly) Slower healing, impaired wound healing, suboptimal surgical outcomes
- More complications including infection and readmission
- Increased morbidity & mortality

Obvious malnutrition



Who is malnourished?

- Diagnosis of malnutrition is not a lab value
- Albumin and pre-albumin are acute-phase proteins that are altered by stress and are not sensitive markers of nutritional status.
- How to best determine nutritional status, History and Physical Exam

Subjective Assessment

- Unintentional wt loss (>10% significant)
- Dietary intake
 - types of food eaten, reduced intake and duration of change
- GI symptoms: anorexia, n/v/diarrhea
- Dysphagia
- Functional capacity
- Dysfunction duration
- Employment change
- Activity level
 - Ambulatory or bedridden
- Metabolic demands from underlying disease states

Medical History

- Acute or chronic illnesses
 - Including physical impediments to eating
- Difficulty with mastication or swallowing
- Recent diet changes and reasons.
 - Change in appetite, loss of taste
- Unusual stress or trauma (surgery, infection)
- Medications and prescriptions
 - Steroids, anticonvulsants, Herbals, etc..
- Substance abuse
- Food intake 24hr, 7day recall.
 - Fad diets, special dietary restrictions

Subjective Global Assessment (SGA) - Exam

- Loss of SQ fat
 - triceps and mid-axillary line at lower ribs
- Muscle wasting in quadriceps & deltoids
- Presence of edema in ankle/sacral region
- Presence of ascites
- Skin, hair, eye, tongue and mouth
 - vitamin and mineral deficiencies

Temporal wasting



Triceps Skin fold



Supraclavicular Wasting



Somatic muscle store depletion



Tongue Atrophy






When do you feed?

- Controversy on how soon is soon enough.
- In healthy individuals as long as 7 days
- Malnourished pts benefit from earlier support
- Surgery guidelines < 72 hours

Patient needs

- Calories
- Protein
- Fluid



Caloric needs

- Harris-Benedict Equation
- Basal Energy Expenditure - BEE
- Works for metabolically active tissue
 - If > 125% IBW, ~25% of additional weight is metabolically active
- Female
 - $655 + (9.6 \times \text{wt}(\text{kg})) + (1.7 \times \text{ht}(\text{cm})) - (4.7 \times \text{age})$
- Male
 - $66 + (13.7 \times \text{wt}(\text{kg})) + (5 \times \text{ht}(\text{cm})) - (6.8 \times \text{age})$

BEE modifiers

- 1.1 = afebrile, paralyzed, sedated
- 1.2 = afebrile, mild to mod stress, minor surgery, intubated
- 1.3 = frequent fever, fulminant sepsis, major surgery
- 1.4 = frequent fever with constant motion, agitation, surgical complications
- 1.5+ = CHI, trauma, Burns
- Metabolic Cart

Protein

- Average daily needs 0.8-1.0 g/kg
- Increased to 1.5-2.0 g/kg in sepsis, trauma, burns
- Reduced to 0.6-0.8g/kg in renal failure/hepatic failure
 - Once on dialysis, no longer protein restrict

Fluid needs

- Service dependant
- 4 cc/hr/kg for first 10kg
- 2 cc/hr/kg for the next 10 kg
- 1 cc/hr/kg for any additional weight >20kg

- Simplified formula
- 30 cc/kg/day

How do you feed

- Three means of feeding
 - Oral
 - Enteral/tube feeding
 - Parenteral nutrition
- Golden rule- If the gut works use it
 - Intestinal function, cost, translocation

Oral diet adequacy

- Eating logistics
 - Mental status
 - Coordination
- Swallow evaluation- If in doubt, check it out
 - Intubation, CVA, dysphagia is common
- Calorie Count
 - Assess how much nutrition they are getting

Calculating an oral diet

- No calculations involved, the food services have standard meal plans for specific orders
- Clear liquids are not adequate
- Any diet above Full liquids is considered adequate po nutrition.

Tube Feeding Indications

- Pts unable to tolerate po with intact GI system

Access

- NG and small bore feeding tubes initially
 - Semi rigid NG only short term/decompression
- PEG/PEJ indicated if >4 weeks
 - Endoscopically placed
- G and J tubes are surgically placed,
 - Other surgery, endoscopic difficulty

Tube Placement

- Pre-pyloric vs. post-pyloric placement
 - Pre-pyloric (preferred) allows intermittent feeding (more physiologic), does not require a pump and there is more information about drug absorption with gastric delivery
 - Post-pyloric feedings should be considered if tube feeding related aspiration, elevation of head of bed $>30^\circ$ contraindicated or GI dysmotility intolerant of gastric feeding.
 - All post-pyloric tubes must use continuous feeding program

Formula

- Dietiticians are very helpful
- Get a formulary card
- Formulas are frequently changing
 - Osmolite 1 Cal- standard formula
 - Replete/Nutren- higher protein, lower CHO
 - Supplena- low protein, low volume- renal formula
 - Nepro/Nutren renal- normal protein, low volume- dialysis
 - Nutrihep- branched chain AA for hepatic encephalopathy
 - Peptamen- semi-elemental formula for malabsorption

Example

66-year-old male unable to eat because of dysphagia after a acute recent stroke. GI tract functioning. Non-ICU patient. Height: 168cm, Weight: 60kg, BMI 21

Questions?

- Harris Benedict Equation?
- Protein Goal?
- Estimated Fluid Requirement?

Caloric Needs

- HB (male) = $66.5 + 13.7(60) + 5(168) - 6.8(66)$ so
BEE = 1280 kcal/day
- Calorie goal: BEE x 1.2 ~1500 kcal/day

Protein Requirements

- Protein goal: $1 \text{ g/kg/day} = 60\text{g/day}$
- No complicating factors in this patient

Fluid Requirements?

- Estimated fluid requirement: $30\text{mL/kg/day} \times 60\text{kg} = 1800\text{mL/day}$

Formula

- Check the formulary for the closest match
- We needed 1500 kcal, 60g protein, 1800 cc H₂O
- Osmolite standard formula has 1.0 kcal/mL and 44g protein/L
- 1500mL/day will provide 1500 kcal/day, 66g protein, 1260 cc free water
- $1800\text{mL} - 1260\text{mL}$ in tube feeding formula = 540mL/day fluid still required
- Remainder as free h₂O flushes

Tube feeding precautions

- Be aware of drugs...
 - with high osmolality or sorbitol content like KCl, acetaminophen, theophylline → can cause diarrhea
 - that clog tubes such as psyllium, ciprofloxacin suspension, sevelamer and KCl (do not use KCl tablets; use liquid or powder form)
 - whose absorption is interfered with by tube feeds such as phenytoin

Parenteral nutrition

- Indications for Parenteral nutrition
 - SBO, ileus, ischemic bowel, high output proximal fistula, severe pancreatitis, active GI bleed, intestinal GVHD, Intractable vomiting/diarrhea

Access and delivery

- Peripheral parenteral nutrition can be given through any IV.
 - Limited concentrations- Amino acids 2.75% and Dextrose 10%
- Total parenteral nutrition requires central access
 - Central line, port, PICC
- Lipid emulsion can go through any IV

Prescribing

- Recall that a 10% solution = 10g/dL = 100g/L; i.e., 10% dextrose = 100g/L (3.4 kcal/g dextrose);
- 5% amino acid = 50g/L (4 kcal/g protein);
- 10% fat emulsion = 1.1 kcal/mL, 20% fat emulsion = 2 kcal/mL

- Determine estimated need for calories, protein and fluid
- We include protein in caloric estimate since amino acids are oxidized and provide energy.
- Fats should be 25-35% of total calories

Practice TPN

- Same patient needs as before 1500 kcal, 60g protein, 1.5 Liters
- Protein 60g = 240 kcal
- 750 kcal from CHO = $(750/3.4) = 220$ g/CHO
- Give 25-35% calories as fat
 - Lipid 20% x 250cc = 500 calories
- 220g/1.5 L = D15, 60g protein/1.5L = AA 4%
1.5L/24hours = 62 cc/hr
- Get a TPN card for electrolytes and additives

Transition from TPN to TF

- Transition from TPN when contraindications to enteral feeding resolve
- Start pt on TF for tolerance and wean TPN
- Once TF is 35-50% of TF then taper down TPN to 1/2
- Once TF > 75% needs, stop TPN

Nutrition support complications

- Aspiration
- Diarrhea
- Abdominal distension/pain
- Refeeding syndrome

Complications

- Aspiration
 - Elevate the head of the bed 30° to 45° during feeding
 - Check residual volumes q 6 hours if continuous or before feedings if intermittent. >150-250 cc is significant.
 - Consider post-pyloric placement
 - Recheck tube placement by x-ray after placement or manipulation

Complications

- Diarrhea; common problem but might not be caused by tube feeding
 - Review medications for sorbitol (in liquid medicines), magnesium, and osmolality
 - Consider infectious etiology (especially *C. difficile*)
 - Rule-out infusion of full strength hyperosmolar formula or medications into jejunum
 - Can try fiber containing formula and, if no infection, loperamide or tincture of opium

Complications

- Abdominal distention or pain
 - Assess for ileus, obstruction or other abdominal pathology
 - Stop the tube feeding until problem resolved then restart slowly
- Constipation
 - Be certain fluid (including water program) is adequate
 - Commonly medication induced, need counter agents
 - Can use fiber-containing formula (may worsen)

Complications

- Refeeding Syndrome
- Repletion of severe malnourished state
 - Low K, Phos, Magnesium
 - Fluid shifts
 - Arrhythmia and death
- Key is recognition in high risk patients and prevention
 - Replace electrolytes before advancing nutrition
 - Monitor labs

Common Calls

- NG/SBFT is out
- PEG, g-tube or j-tube is out
- High residuals
- Elevated glucose
- Weekend TPN
- No formula, attending wants to feed

Questions?
